

PRESENT STATUS AND FUTURE STRATEGIES OF FLORISTIC STUDIES
IN INDIA : THE UPPER GANGETIC PLAIN

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The Upper Gangetic Plain is a botanical region north of the Vindhya Mountains. In the west, it includes Delhi and portions of Eastern Rajasthan and in the east, it is bounded by Bihar. Duthie (1903) has included the adjacent Siwalik and Sub-Himalayan tracts within the scope of his *Flora of the Upper Gangetic Plain*, as he found it difficult to fix a workable boundary line for the area just at the base of the Himalayas. This has resulted in bringing together many heterogeneous Himalayan elements into an otherwise uniform flora of the plains. Somdeva (1968) has made a strong plea for a rethinking regarding the northern limit of the region, so as to rectify this phytogeographical incongruity. He opines that this boundary can only be the base of the Siwaliks with a definite altitudinal restriction. Rau (1969) and Raizada (1976) support this view. However, Duthie's delimitation of the area was kept in view by the various authors after him in their floristic treatments. For the sake of convenience, this is being followed here also.

Some of the pioneer floristic works on this region include those of Munro (1844), Edgeworth (1852, 1867), King (1871, 1878, 1882), Anderson (1859) and Duthie (1886). Parker (1918), B. L. Gupta (1928) and Kanjilal (1933) have also included portions of this area within the scope of their publications. Duthie's (1903-1929) *Flora* still continues to be the major floristic work meant exclusively for the area. The portions from Araceae to Cyperaceae of

the *Flora* was published by Parker and Turrill. Poaceae was not included. This lacuna was filled up by Raizada and associates (Raizada, 1954; Raizada, Bharadwaja and Jain, 1957; Raizada and Jain, 1964, 1966). In his most recent work, Raizada (1976) has brought together all the additions made to Duthie's *Flora*.

The flora of this area is taken to be well-known. However, the recent spurt of publications on new additions by various authors gives a clear indication otherwise. More than 280 taxa of angiosperms have already been added to Duthie's work. Raizada (1931, 1935, 1936, 1939, 1950, 1958) gave the lead in recording such additions and many others followed suit. Some of these plants so added, like, *Acalypha australis* L. (Singh, 1967), *Anthriscus scandicina* Mans. (Babu, 1968), *Eupatorium riparium* Reg. (Babu, 1969 a), *Galinsoga ciliata* Blake (Babu, 1969 b), *Silene alba* Krause (Nair, 1969), *Solanum triquetrum* Cav. (Husain, 1968), *Soliva anthemifolia* R. Br. (Bhattacharya, 1963 a), and *Trifolium tomentosum* L. (Babu, 1969 c) were detected for the first time in India. Rau (1961) described a new taxon namely *Alectra parasitica* A. Rich. var. *chitrakutensis* Rau, from Banda District, Uttar Pradesh. *Peucedanum dehradunensis* Babu (*Indian For.* 96 : 535, 1970) is another novelty discovered from this area. Authors like Jain R. K. (1958), Jain S. K. & Kotwal (1960), Kapoor & Srivastava (1960), Singh & Singh (1961), Murty &

Singh (1961 a, 1961 b, 1966), Nair & Bhartya (1962), Raizada & Sharma (1962), Singh (1963, 1964), Vaid (1964), Dakshini & Chauhan (1965), Hingoorani & Gaur (1965), Verma *et al.* (1965), Babu (1966), R. S. Gupta (1966), Malhotra (1966, 1969), Singh & Murty (1966), Dixit & Siddiqui (1966), Husain (1967), Saxena (1967), Jain S. K. (1968), Dixit & Singh (1968), Maheshwari & Sharma (1969), Venkata Reddi (1969 a), Naithani & Gaur (1969), Kapoor & Kapoor (1970), Malhotra (1970, 1971), Janardhanan & Prasad (1971), Singh (1971 a), Somdeva & Arora (1971), Bahadur *et al.* (1973, 1973 a) and Sahni & Naithani (1974) added to our knowledge on the distribution of some additional taxa in the Upper Gangetic Plain.

In the past, Universities and other institutions within the area, interested in floristic studies were limited (*see* Subramanyam & Nayar, 1971). A perusal of the literature shows that workers of some of these institutions have attempted to study the flora of certain scattered pockets in this area. Srivastava (1938, 1949) prepared lists of plants occurring in Allahabad. Kapoor (1962), Srivastava (1963), Balapure & Srivastava (1964), Sharma (1964) and Husain & Kapoor (1970), made valuable contributions towards a better knowledge of the flora of Lucknow District. Balapure (1971) has prepared an account, with useful keys, of nearly 130 taxa of grasses occurring in Lucknow District. Sen (1960), Singh (1961), Trivedi & Sharma (1965), Dixit, Verma & Srivastava (1966), Sahai & Singh (1968), P. K. Gupta (1969), Siddiqui & Dixit (1969), Singh & Dixit (1972), and Srivastava (1976) studied the flora of Gorakhpur. Account of the Cyperaceae of Dehra Dun valley and adjacent Siwaliks was given by Somdeva & Naithani (1974, 1975). Gandhi *et al.* (1961) prepared a similar account on the grasses of Jaipur. Thanks to

the works of Vyas (1962 a, 1962 b, 1964 a, 1964 b, 1964 c, 1966) and Vyas & Gupta (1962) the flora of Alwar is fairly well-known now. Other areas that have attracted the attention of different workers include Kota (R. S. Gupta, 1965, 1966 a), Agra (Watts, 1953; Bharadwaj *et al.* 1956), Ajmer (Sharma, 1958), Bharatpur (Sarup, 1960; Sarup & Tandon, 1962), Bhopal [Oommachan, 1966 (1971), 1976; Oommachan & Billore, 1969], Chambal Valley (Agarkar, 1969), Delhi (Mukerjee, 1953; Rangaswamy & Chakrabarty, 1966), Gwalior (Kenover, 1924; Agarkar & Tuteja, 1965, 1969), Hastinapur (Murty & Singh, 1961), Jaunpur (Singh & Dixit, 1969; Singh & Singh, 1972), Meerut (Singh, 1971), Mirzapur (Srivastava, 1955; Venkata Reddi, 1969), Muzaffarnagar (Gupta, 1960, 1961; Tayal & Bhasin, 1971) and Saugor (Pandeya, 1949, 1953; Bhattacharya, 1955; Srivastava, 1956). Most of these works are in the form of check-lists. Maheshwari's (1963) *Flora of Delhi* is a more detailed work with keys and other useful information. The same author (1966) published a companion volume of illustrations. This flora, done in a reputed University of our country has definitely acted as a morale booster and from the publications coming out (Srivastava, 1976; Oommachan, 1976), the enquiries coming and the researchers visiting the regional & national herbaria for their work, it is evident that some other post-graduate institutions within the area are also taking up similar studies now.

After its reorganisation, attempts have been made by the Botanical Survey of India for a systematic study of the flora of some areas of this region. Rau (1969) compiled a check-list for the Flora of the Upper Gangetic Plain based on all the informations available then. Babu's (1977) work on the herbaceous flora of Dehra Dun is an eye opener to the fact that a detailed and careful study of these areas will definitely be scientifically rewarding. Panigrahi & Arora (1962), Arora *et al.* (1964),

Rajagopal (1965), Rajagopal & Panigrahi (1965, 1966), Panigrahi & Rajagopal (1967, 1968) and Panigrahi & Saran (1968) studied the flora of Allahabad. Bhattacharya (1963 b, 1964), prepared a preliminary account on the flora of Mirzapur. The arid zone unit of Central Circle, Botanical Survey of India explored the districts of Jhalwar, Kota and Bundi. Majumdar (1971) has compiled a synoptic flora for this area, the first part of which has already come in print. Other important pockets for which floristic accounts have been published include Bahraich (Panigrahi *et al.*, 1969), Bulandshahr (Singh, 1969), Dehra Dun-Mothronwala Swamp (Dakshini, 1970, 1974), Dehra Dun-Sahasradhara (Malhotra, 1972), Gorakhpur (Panigrahi & Saran, 1967), Hamirpur (Bhattacharya & Malhotra, 1964), Lucknow (Patil, 1958, 1960, 1963) and Shahabad (Jain & Kotwal, 1960 a).

A review of floristic studies on the area during the period after the publication of Duthie's Flora, thus reveals that there is still scope for further intensive exploration. It is doubtful whether the portions of eastern Rajasthan included have been in a well explored condition at the time of the completion of Duthie's work. Majumdar (1971) points out that Duthie's collections from Rajasthan, east of Aravalli mountains represented in the Central National Herbarium, Calcutta and the Forest Research Institute, Dehra Dun are in fact only from Ajmer-Merwara and Mount Abu. Throughout the text, Duthie has not mentioned any other specific locality in Rajasthan except for Bhurtpore (Bharatpur?) cited two or three times based on Munro's collections.

After Duthie's work there was a long period of nearly 30 years of botanical inactivity in this area. Even the renewed interest in floristic studies that we observe in recent years has resulted in a good knowledge of the flora of only a few more scattered areas. Jain (1970) has tried to assess the status of floristic studies in Rajasthan based on the number

and contents of the papers published. He includes only Alwar in the list of fairly well explored areas from among the Eastern Rajasthan portions coming within the limits of the Upper Gangetic Plain. Rau (1959) has pointed out that the eastern districts of Uttar Pradesh particularly the forests of Gorakhpur and Mirzapur needs botanical attention. Even though some exploration work has since been done here, especially in the Gorakhpur and Mirzapur areas, there is scope for intensive explorations in other areas. The fertile plains of this region are of great botanical interest. The large tracts of cultivated lands available here also form suitable breeding ground for many weeds. A thorough knowledge of this element in addition to that of other floristic elements is a necessity which cannot be ignored in an agricultural country like ours.

While concluding that many areas of the Upper Gangetic Plain still hold ample opportunities for further studies, we have also to admit that there are many other areas within our country which are botanically much less known. A detailed study of these areas are also of great importance. The task is immense and there are limiting factors like the non-availability of enough workers and finance forcing the Botanical Survey of India to fix priorities in favour of comparatively under-explored and unexplored areas. Thus the areas supposed to be botanically better known are liable to be neglected. This problem can be solved to some extent, if more and more Universities and Colleges come forward to take up areas near-about their institutions for detailed floristic studies.

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